

**TWO NEW SPECIES OF THE NEOTROPICAL LEAFHOPPER GENUS
CALDWELLIOLA YOUNG (HEMIPTERA: CICADELLIDAE)
WITH A KEY TO MALES**

STUART H. MCKAMEY

Systematic Entomology Laboratory, PSI, Agricultural Research Service, U.S. Department of Agriculture, c/o National Museum of Natural History, Smithsonian Institution, Washington, DC 20560-0168, U.S.A. (e-mail: smckamey@sel.barc.usda.gov)

Abstract.—Two new species of *Caldwelliola* are described, *C. sinuata* from Honduras and *C. trilineata* from Ecuador, bringing the current total valid species in the genus to eleven. A key to males of all species is presented. The species *C. bipunctata* Nielson and Godoy, 1995, is placed in synonymy under *C. lutea* Signoret, 1855, n. syn. One species, *C. caucana* Young, has been implicated as a likely vector of the bacterium *Xylella fastidiosa* Wells, which causes the “*crepera*” disease, coffee leaf scorch, in Colombia and elsewhere in the Neotropical Region.

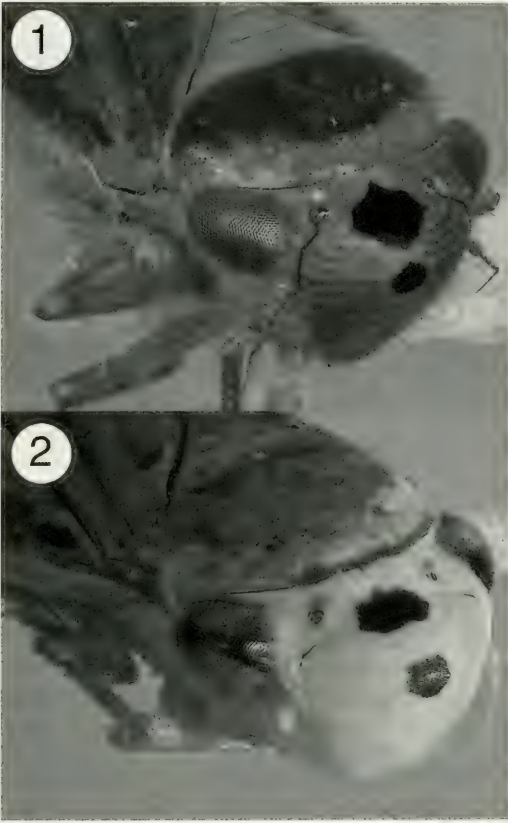
Key Words: Cicadellinae, coffee leaf scorch, *Xylella*, Honduras, Ecuador, *Hortensia*, *Chlorogonalia*

There is some truth in the generalization that “most leafhoppers are small and green,” as many are cryptically colored and blend into the green foliage upon which they feed, and most are less than a centimeter long. The subfamily Cicadellinae (*sensu* Young 1968), or sharpshooters, is especially large and diverse. The New World, mostly tropical fauna alone comprises over 1,500 species in over 230 genera. Moreover, the tribe Cicadellini, with over 1,100 New World species, contains some of the largest leafhoppers and also some of the most common small green leafhoppers.

Within this tribe, *Hortensia* Metcalf and Bruner, *Chlorogonalia* Young, and *Caldwelliola* Young are commonly encountered, are externally similar to each other, and all have small, green species distributed from Mexico through Bolivia. Although *Hortensia* is monotypic, individuals vary surprisingly in size

across its range, yet are easily identified by the coloration of the head (Young 1977: fig. 654). *Chlorogonalia* and *Caldwelliola*, however, are less easily distinguished, especially from each other because of superficial similarities in size and color, especially that of the head (Figs. 1–2). Diagnostic features to distinguish undissected males and females of these two genera are provided in a review of *Chlorogonalia* (McKamey 2006).

When originally described (Young 1977), *Caldwelliola* contained eight species, six of them new. Nielson and Godoy (1995) described the species *C. bipunctata* and McKamey (2006) added one additional species (*Chlorogonalia tharma* Young). In the present paper, two new species of *Caldwelliola* are described and one is placed in synonymy. A key to males of all species is presented so that *C. caucana* Young, a likely vector



Figs. 1–2. Oblique aspect of anterior portion. 1, *Chlorogonalia ultima*. 2, *Caldwellioliola reservata*.

of coffee leaf scorch disease (*crespera* in Spanish) in the Neotropics (McKamey 2006), can be identified.

Caldwellioliola Young

Caldwellioliola Young 1977:1039. Type species by original designation: *Tettigonia reservata* Fowler.

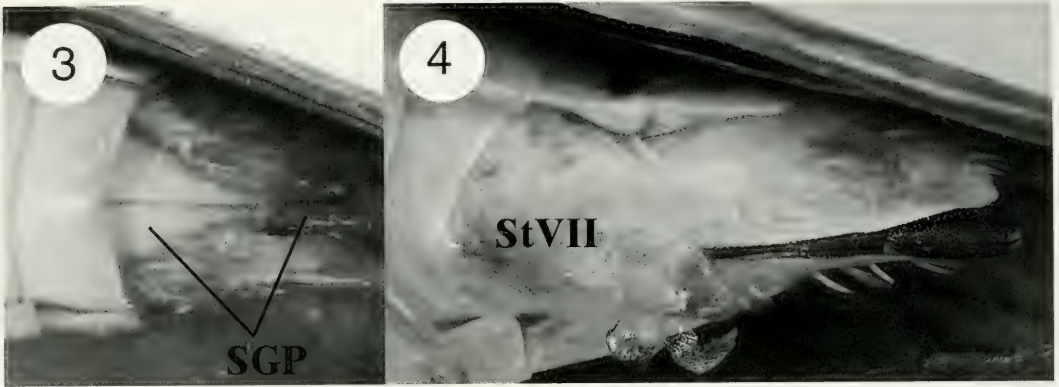
Diagnosis.—Male with subgenital plate broad at base, strongly narrowed from base to apex (Fig. 3), styles truncate or narrowly rounded, aedeagal paraphyses present, bifurcate, sometimes flattened, abdominal segment XI length 0.3–0.7× length of entire pygofer (Fig. 6); sternum II apodemes usually exceeding posterior margin of segment III (Fig. 5); female with sternum VII produced posteroventrally,

acute (Fig. 4), its length almost equal to exposed pygofer length (covering most of its base). The form of the male subgenital plate and female sternum VII are visible in undissected specimens and sufficient to distinguish *Caldwellioliola* from *Chlorogonalia*, which have the subgenital plates strongly narrowed abruptly near their apices and female sternum VII only about half the length of the exposed portion of the pygofer.

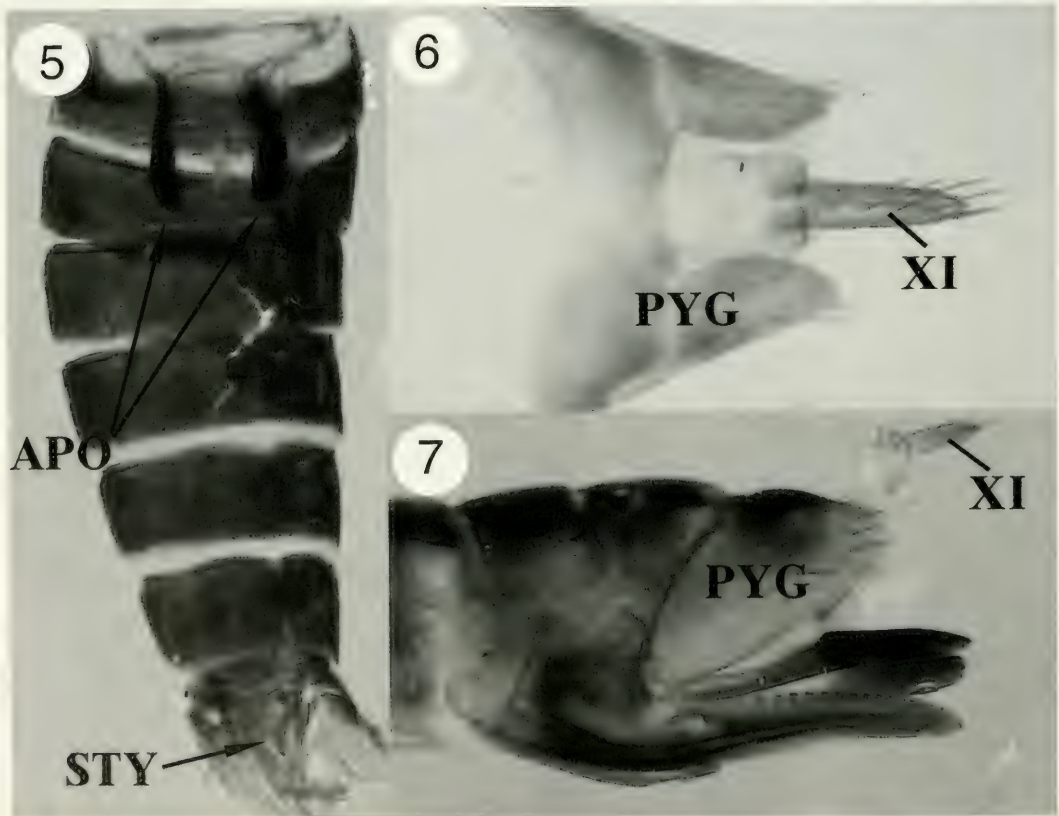
Description (modified from Young 1977).—**Length:** Including forewings in repose, 5.2–9.0 mm.

Head: Crown moderately produced; median length of crown varying from slightly less than $3/5$ to more than $3/4$ interocular width; anterior margin broadly rounded in dorsal view; margin not angular at transition from crown to face; ocelli located on or slightly behind a line between anterior eye angles; crown surface with a transverse concavity before ocelli and with a shallow median concavity; lateral clypeal sutures extending onto crown; clypeus slightly flattened in profile; muscle impressions indistinct; clypellus with contours of its lower portion slightly more horizontal than profile of remainder of face; transclypeal suture obsolete medially.

Thorax: Pronotum narrower than transocular width of head; dorsopleural carinae complete; disk smooth, without pubescence; without transverse rugae on its posterior portion. Forewing coriaceous with membrane including all of apical cells except basal portion of outermost and extending basad a short distance along costal margin (except indistinct in *C. lutea* (Signoret)); veins distinct, 3 closed anteapical cells, bases of inner and outer cells almost in transverse line with claval apex, base of cell more proximal; four apical cells, base of fourth usually located more proximally than base of third; without an anteapical plexus of veins; forewings of female in



Figs. 3-4. Distinguishing external features of *Caldwellioloa* species in undissected males and females, respectively. *SGP*, subgenital plate; *StVII*, abdominal sternum VII. 3, *C. reservata* male. 4, *C. reservata* female.



Figs. 5-7. Distinguishing internal features of *Caldwellioloa*. 5, *C. reservata*, cleared male abdomen, showing the large sternum II apodemes (*APO*) often, but not always present in *Caldwellioloa*, and the blunt genital style (*STY*). 6-7, Dorsal and lateral aspects of large abdominal segment XI in *Caldwellioloa*. 6, Male of *C. caucana*. 7, Female of *C. reservata*.

rest position exceeding apex of ovipositor. Hindleg with femoral setal formula 2:1:1; first tarsomere length slightly greater than combined length of last 2 tarsomeres and with 2 parallel rows of small setae on plantar surface.

Male terminalia: Pygofer moderately produced posteriorly; posterior margin varying from narrowly to broadly convex; without processes. Subgenital plates separate throughout their length; extending almost as far posteriorly as pygofer apex; each broad at base, abruptly narrowing at about mid length; triangular and with macrosetae uniseriate. Style without preapical lobe; apex truncate, narrowly rounded, or acute. Connective broadly Y-shaped or triangular. Aedeagus symmetrical, with elongate basal apodemes, without processes. Paraphyses present, bifurcate, appearing contorted or linear, narrow throughout.

Female terminalia: Abdominal sternum VII with posterior margin produced and angular or subangulate. Genital chamber without sclerites. Ovipositor with second valvulae each broadened beyond basal curvature and bearing quadrate teeth. Pygofer with macrosetae on posterior half.

Coloration: Most species dull green except head, anterior portion of pronotum, mesonotum, and scutellum sometimes tan to yellow (except *C. lutea*, which is entirely yellow); crown and frontoclypeus usually with brown or black markings visible in both dorsal and anterior views.

Distribution.—Mexico, Central America, Venezuela, and Colombia to Bolivia, west-central Brazil.

Comments.—Most species of the genus *Caldwellioli* have little intraspecific color variation. The three exceptions, revealed by their uniform genitalia (especially the aedeagus) are *C. andamira* (Figs. 16, 25), which has two distinct patterns of crown coloration, and *C. lutea* (Figs. 19, 26) and *C. reservata*

(Figs. 20–21), which each have two distinct patterns of pronotal coloration.

The original description of *C. lutea*, based on a Guatemalan specimen, states that the prothorax has two dark spots along the median line (as in Fig. 19). Fowler (1900), who had specimens from Guatemala and Mexico, mentioned that the posterior spot is sometimes absent, presumably referring to the illustrated specimen, from Atoyac, Veracruz, which had only one spot (as in Fig. 26). Young (1977) saw specimens from Mexico, Guatemala, El Salvador, and Costa Rica, and illustrated a specimen from Veracruz that had only the anterior spot. Nielson and Godoy (1995) described *C. bipunctata* from Costa Rican specimens, distinguishing their new species from *C. lutea* “by the presence of 2 black spots on the pronotum, the paraphysis branched before the middle and by the shorter sternal abdominal apodemes.” While these features differ from the illustration provided by Young (1977), the spots on the pronotum match Signoret’s description. Among specimens in the National Museum of Natural History (USNM), there are several series with the single, anterior pronotal spot; all are from Mexico, from Veracruz (Cordoba and Jalapa) and San Luis Potosí (Tamazunchale). The USNM specimens with two pronotal spots are from Guatemala, El Salvador, and Nicaragua. The Jalapa specimen illustrated by Young (1977) was reexamined and discovered to differ somewhat from Young’s illustration, having the paraphysis branched before the middle and shorter abdominal apodemes. In the absence of any known differences, including the number of spots on the pronotum, *C. bipunctata* is considered to be a junior synonym of *C. lutea*. It seems that northern populations, from Mexico, have one spot on the pronotum, while southern populations, from Guatemala to Costa Rica, have two. Never-

theless, Nielson and Godoy (1995) wrote that "*C. lutea*" (with the one-spotted pronotum) occurs in Costa Rica. More collecting may expose mixed populations.

SPECIES LIST

C. andamira Young 1977: 1044. Venezuela.

C. caucana Young 1977: 1043. Colombia.

C. cunahua Young 1977: 1046. Peru.

C. insularis Young 1977: 1041. Venezuela, Trinidad, Tobago.

C. lutea (Signoret). Mexico, Guatemala, El Salvador, Nicaragua, Costa Rica.

Tettigonia lutea Signoret 1855: 773.

Caldwellioli bipunctata Nielson and Godoy 1995: 194, **new synonymy**.

C. reservata (Fowler). Honduras, Belize, Costa Rica, Panama, Colombia.

Tettigonia reservata Fowler 1900: 267.

C. selvola Young 1977: 1046. Peru.

C. sinuata, n. sp. Honduras.

C. solimoeana Young 1977: 1048. Peru, west-central Brazil.

C. tharma (Young). Ecuador, Peru, Brazil.

Chlorogonalia tharma Young 1977: 576.

C. trilineata, n. sp. Ecuador.

KEY TO MALES OF *CALDWELLIOLA*

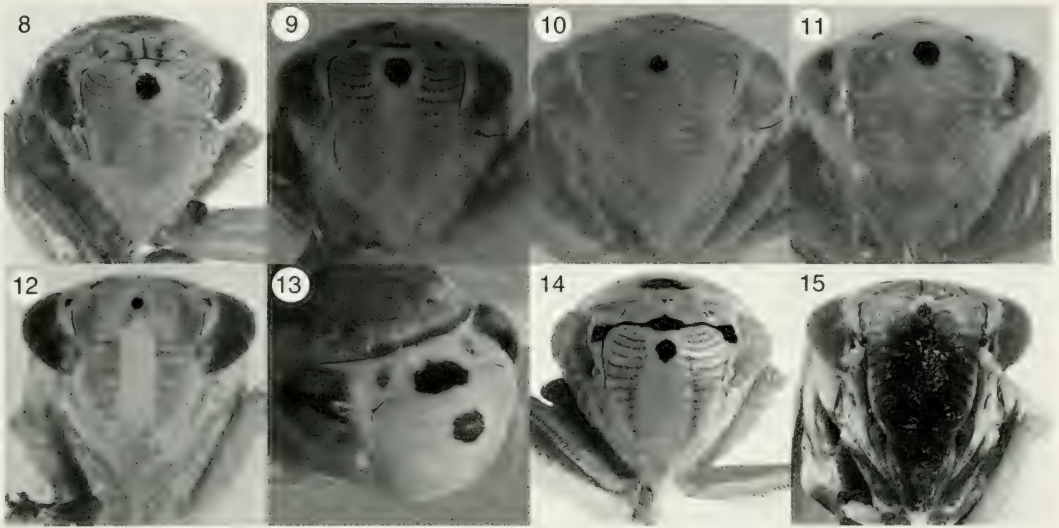
1. Crown of head with conspicuous, separate median black spot, without longitudinal or transverse black lines (Figs. 17–18, 20–22); aedeagus in lateral view broadest at mid length or, if not, pronotum with pale collar along anterior margin 2
 Crown of head without discal spot (Figs. 16, 19, 24); aedeagus broadest basally or distally or, if at mid length (*trilineata*, n. sp., Fig. 35), then shaft apex emarginate 5
2. Sternal abdominal apodemes very slender, not capitate, extending beyond posterior margin of sternum III (Fig. 5) 3

- Sternal abdominal apodemes not extending posteriorly to margin of sternum III, capitate or not 4
3. Frontoclypeus black below dorsal, distal macula, with which it is contiguous (Fig. 15); more than 8.5 mm in length including forewings in repose *tharma*
 – Frontoclypeus pale green except dorsal, distal black macula (Figs. 8–14); less than 6.5 mm in length including forewings in repose (Fig. 13) *reservata*
4. Pronotum and mesonotum without black spots (Fig. 18) *insularis*
 Pronotum and mesonotum each with pair of black spots (Fig. 17) *caucana*
5. Sternal abdominal apodemes longer than wide 6
 – Sternal abdominal apodemes wider than long 8
6. Length less than 5.5 mm; without conspicuous black spots on pronotum or mesonotum (Fig. 16) *andamira*
 – Length more than 6.0 mm; with or without black spots on pronotum or mesonotum 7
7. Entirely pale yellow except with 1 or 2 median black spots near mid length of pronotum and pair of black spots on mesonotum (Figs. 19, 26) *lutea*
 – Mostly dark green, crown with median line and postfrontal sutures black (Fig. 24) *trilineata*, n. sp.
8. Pygofer rounded distally *selvola*
 – Pygofer subacute distally (Figs. 36, 38) 9
9. Posteroventral pygofer margin concave; head with black spot at apex *cunahua*
 – Posteroventral pygofer margin linear or convex; head without black spot at apex 10
10. Head without black transverse line across crown; pygofer dorsal margin in lateral view uneven, almost linear and with its highest point at apex *solimoeana*
 – Head with solid, black, transversely sinuous line across crown; pygofer dorsal margin in lateral view weakly and evenly concave, and with its highest point before apex (Fig. 38) *sinuata*, n. sp.

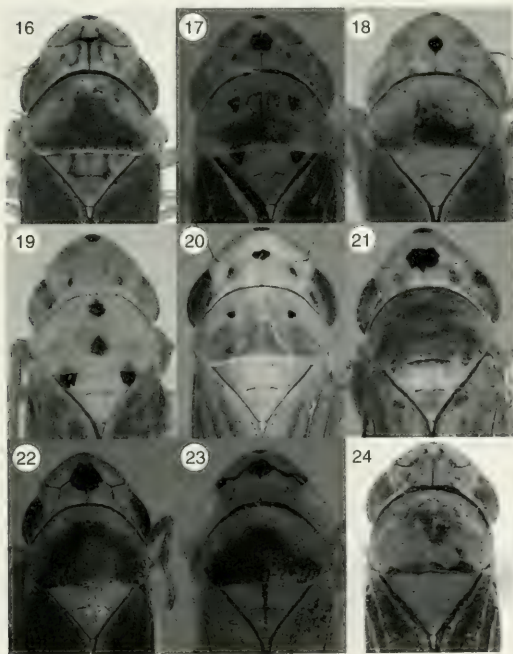
***Caldwellioli trilineata* McKamey, new species**
 (Figs. 15, 24, 34–36)

Diagnosis.—Crown lacking median spot, with median line and postfrontal sutures black; pronotum and mesonotum lacking dark maculae.

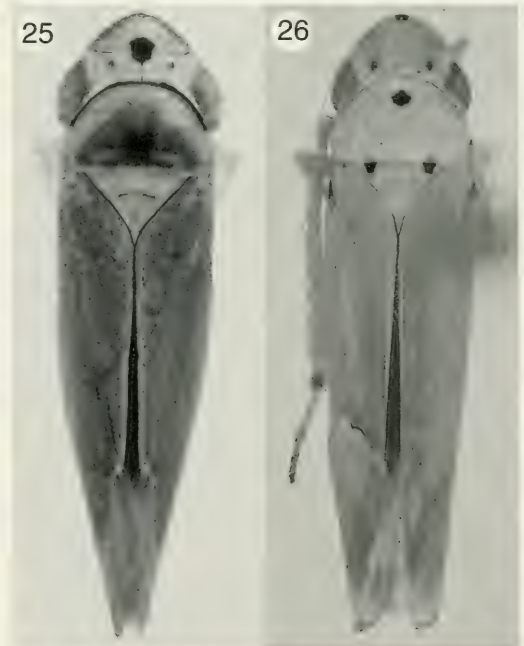
Description.—*Length including forewings in repose*: Male 7.2 mm. *Head*:



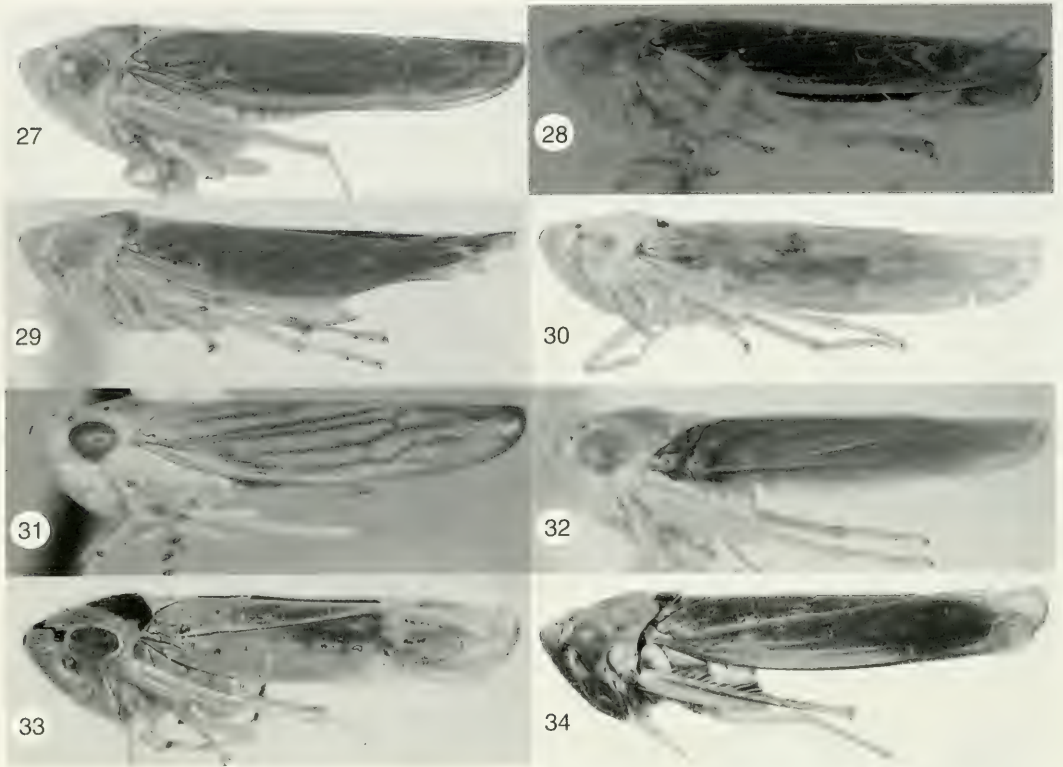
Figs. 8-15. Anterior views of *Caldwellioliola* species. 8, *C. andamira*. 9, *C. caucana*. 10, *C. insularis*. 11, *C. lutea*. 12, *C. selvola*. 13, *C. reservata* (oblique view). 14, *C. sinuata*. 15, *C. trilineata*.



Figs. 16-24. Detail dorsal views of *Caldwellioliola* species. 16, *C. andamira*. 17, *C. caucana*. 18, *C. insularis*. 19, *C. lutea* from Yepocapa, Guatemala. 20-21, *C. reservata* from Central America and Colombia, respectively. 22, *C. tharma*. 23, *C. sinuata*. 24, *C. trilineata*.



Figs. 25-26. Dorsal habitus views of two variably colored *Caldwellioliola* species. 25, *C. andamira* (compare with Fig. 16). 26, *C. lutea* from Veracruz, Mexico.



Figs. 27-34. Lateral habitus views of *Caldwelliella* species. 27, *C. andamira*. 28, *C. caucana*. 29, *C. insularis*. 30, *C. lutea*. 31, *C. reservata* (Colombia). 32, *C. selvola* (forewing detached). 33, *C. sinuata*. 34, *C. trilineata*.

Median length of crown $0.6 \times$ interocular width and $0.3 \times$ transocular width; ocelli located behind a line between anterior eye angles, each slightly closer to adjacent anterior eye angle than to median line of crown. *Thorax*: Pronotum lateral margins parallel. Apodemes of abdominal sternum II slightly longer than wide; twisting to appear falcate in dorsal view and curved medially; apices separated from each other by approximately their width, not attaining posterior margin of tergum III. *Male terminalia*: Pygofer (Fig. 36) broadly produced dorsoposteriorly, subacute, with large macrosetae scattered toward margins posteriorly and dorsally, lacking cluster of smaller macrosetae; subgenital plate abruptly constricted at mid length; connective broadly triangular; style short, not at-

taining constriction of subgenital plate, apex bluntly rounded. Aedeagus (Fig. 35) with ventral half of shaft narrow throughout in ventral view, in lateral view with distinct convexity in middle—in ventral view wider than ventral half of shaft; apex weakly emarginate, ventral margin with short concavity preapically; paraphyses present, bifurcate, long and gradually narrowing to apex, but not exceeding pygofer margins. *Coloration*: Mostly dark green; crown of head with median line and postfrontal sutures black (Fig. 24); frontoclypeus (Fig. 15) with dorsal, distal maculae present but obscured by mostly dark brown color of remaining surface; anterior portion of pronotum concolorous with posterior portion. *Female*: Unknown.



Figs. 35–38. Lateral views of aedeagus and male pygofer, respectively, of new *Caldwellioli* species. 35–36, *C. trilineata*. 37–38, *C. sinuata*.

Material examined.—Holotype (National Museum of Natural History, Smithsonian Institution, Washington, D.C.) male with labels “Archidona/ (Ecuad.)/ R.Haensch S.,” and “HOLOTYPE/ *Caldwellioli*/ *trilineata*/ McKamey.” Paratype male, same locality and collection as holotype and with paratype label.

Etymology.—The specific name is Latin for 3-lined, referring to the black longitudinal lines on the crown.

Comments.—Although lacking a black spot on the crown as in *C. reservata* and *C. insularis*, *C. trilineata* has an aedeagus closely resembling those of both these species. The crown markings most closely resemble those of some *C. andamira* (Fig. 16).

***Caldwellioli sinuata* McKamey,
new species**

(Figs. 14, 23, 33, 37–38)

Diagnosis.—Head with solid, black, transversely sinuous line across crown.

Description.—*Length including forewings in repose*: Male 5.4 mm, female 5.8 mm. *Head*: Median length of crown 0.7–0.8× interocular width and 0.4× transocular width; ocelli located behind a line between anterior eye angles, each slightly closer to adjacent anterior eye

angle than to median line of crown. *Pronotum*: Lateral margins parallel; apodemes of abdominal sternum II slightly wider than long, not attaining posterior margin of tergum III. *Male terminalia*: Pygofer (Fig. 38) broadly produced posteriorly, subacute, dorsal margin weakly and evenly concave in lateral view, with large macrosetae scattered across posterior half and with cluster of smaller macrosetae near ventral margin at mid length; subgenital plate gradually constricted at mid length; connective broadly triangular; style short, not attaining constriction of subgenital plate, apex acute. Aedeagus in lateral view (Fig. 37) subparallel throughout length, though narrowest near mid length, curved ventrally then dorsally; apex produced posteriorly; paraphyses present, bifurcate, gradually narrowing, long, exceeding pygofer margins dorsoposteriorly. *Coloration*: Male and female head yellow green throughout except with with solid, black, transversely sinuous line across crown (Figs 14, 23); pronotum lacking dark maculae, anterior portion yellow along margin; mesonotum and scutellum with midline black.

Material examined.—Holotype (National Museum of Natural History, Smithsonian Institution, Washington, D.C.) male with labels “Tegucigalpa/ Honduras/ III.30.[19]17,” “F.J. Dyer Col./ No. 22997/ 23296” and “HOLOTYPE/ *Caldwellioli*/ *sinuata*/ McKamey.” Paratypes (National Museum of Natural History): 2 males, same data as holotype, 1 female with labels “La Ceiba/ Honduras,” “F.J. Dyer/ Coll,” and “11198to/ 11334/ vii-19-[19]16.” All paratypes labeled as such.

Etymology.—The specific name refers to the aforementioned diagnostic coloration of the crown.

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